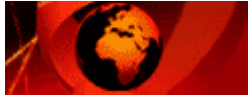



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Dark energy tops science class

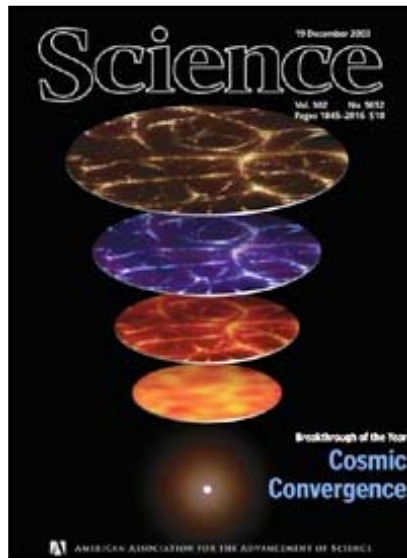
By Paul Rincon

BBC News Online science staff

A series of breakthroughs in the quest to identify the mysterious fabric of the Universe has topped a list of the 10 key scientific advances of 2003.

The winning discoveries provide further evidence that the Universe is composed largely of dark matter and dark energy.

The eagerly awaited top 10, which is compiled annually by the journal *Science*, is always controversial, and this year's proves to be no exception.



Science publishes the list annually

Second place went to scientists who identified genes for mental illness.

Particular mention was given to studies that found genes responsible for increasing a person's risk of schizophrenia, depression and bipolar disorder.

Third place was taken by the authors of studies appearing to show evidence of global climate change.

'Convincing evidence'

"The consensus about global warming has reached a point where it's very difficult indeed to deny what's going on," Don Kennedy, editor-in-chief of *Science*, told BBC News Online.

The papers included a study which linked unusually warm waters in the western Pacific and Indian oceans to the products of greenhouse gases and research demonstrating increases in the flows of rivers emptying into the Arctic Ocean.

The list of breakthroughs was decided by *Science* magazine's news and editorial teams.


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"We looked for science that would lead to new things. Not necessarily applications in human service, but new extensions of human knowledge," Mr Kennedy added.



Mapping of galaxies helped provide the evidence for dark matter

Of the position of top breakthrough, awarded to researchers who had elucidated the nature of dark energy and dark matter, the journal said: "[This] ends a decades-long argument about the nature of the Universe and confirms that our cosmos is much, much stranger than we ever imagined."

Cosmic microwaves

The "concordance" model of the Universe proposes that over 70% is made up of dark energy, with around 25% composed of dark matter and only 5% of normal matter. In this model, dark matter is constantly being stretched by dark energy.

In February, the Wilkinson Microwave Anisotropy Probe (Wmap) satellite took the most detailed picture yet of the cosmic microwave background - an image of the infant cosmos when it was less than 400,000 years old.

In July, astronomers from the Sloan Digital Sky Survey (SDSS), which aims to map out a million galaxies, published a research paper in which they superimposed their own galaxy-clustering data on Wmap's microwave data.

They claim the results prove that dark energy must exist.

But on Friday (12 December), an international group of astronomers claimed analysis of data returned from the European Space Agency's (Esa) XMM-Newton satellite observatory casts doubt on the existence of dark energy.

The astronomers measured the quantity and energy of X-rays emitted by eight distant galaxy clusters. They say their results may imply that the density of matter in the Universe is very high, contradicting the popular concordance model.

"To account for these results you have to have a lot of matter in the Universe and that leaves little room for dark energy," said Alain Blanchard of the Observatoire Midi-Pyrenees in France.

Fuller details of the top 10 list are outlined below:

Science magazine's breakthroughs of the year

- **1. Illuminating the dark Universe.** Satellite and telescope data cemented the idea that the Universe is composed mainly of dark energy and dark matter.
- **2. Cracking mental illness.** Researchers identified genes that reliably increase one's risk of inherited disorders, such as schizophrenia, depression and bipolar


disorder.

- **3. Climate change impacts.** Scientists reported melting ice, droughts, decreased plant productivity, and altered plant and animal behaviour.
- **4. RNA advances.** Scientists explored how small ribonucleic acids (RNAs) impact cell behaviour, from early development to gene expression.
- **5. Zooming in on single molecules.** Collaborations between biologists and physicists captured the activities of individual molecules inside cells.
- **6. Starbursts and gamma rays.** Scientists improved our understanding of the most energetic explosions in the universe: tremendous blasts of energy called gamma ray bursts.
- **7. Spontaneous sperm and egg cells.** The observation that embryonic stem cells can develop into both sperm and eggs may help scientists learn how some kinds of infertility arise.
- **8. Left-handed materials.** Several research teams confirmed that certain high-tech materials can bend light and other electromagnetic radiation in the "wrong" direction.
- **9. The self-reliant Y chromosome.** The genetic sequence of the human male Y chromosome revealed it has duplicate genes. Thus, when mutations arise and a new gene is needed, a twin copy is on hand.
- **10. Possible cancer therapies** In June, researchers announced that a drug which limits the blood supply to tumours, given with chemotherapy drugs in a large clinical trial, prolonged the lives of patients with advanced colon cancer.

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